Forest Site Management Section
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SILVICULTURE NOTE 18

MOTOR-MANUAL SITE PREPARATION WITH THE HAWK POWER SCALPER:

Summary of Four Trials

Objective

This silviculture note summarizes the results of four trials that compared the effects of site preparation with the Hawk Power Scalper on the growth of planted seedlings.

Background

The Hawk Power Scalper is a hand-held chainsaw-powered implement that has been used operationally for site preparation on a small scale in the interior of British Columbia since the late 1980s. Typically, the tool is used to remove organic material and form patches of mineral soil for planting. It was developed by Bruce Hawkinson of Prince George, and features four double torsion spring tines mounted on a specially designed hub attached to the end of the chainsaw bar. The operator can use a harness to help support the tool. The USDA Forest Service Technology and Development Program has developed a modified digging head for the implement (Windell 1996).

Site Description

Results presented here are from four trial sites: Iron Creek near Fort St. John; Goat River near McBride; Canim Lake near 100 Mile House; and Toquart Bay near Ucluelet (Figure 1). A fifth trial, established in a dry zone near Nakusp, was abandoned due to maintenance problems. Site characteristics and histories are described in Table 1.

FIGURE 1. Location of trial sites.

Methods

Trials were established from 1987 to 1989 to compare the growth of seedlings planted in patches formed by the Hawk Power Scalper and other manual site preparation treatments. The treatments are summarized by site in Table 2.

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TABLE 1. Descriptions and histories of trial sites

Site	Iron Creek	Goat River	Canim Lake	Toquart
Forest District	Fort St. John	McBride	100 Mile House	Port Alberni
Biogeoclimatic classification	BWBSwk2, 01	ESSFwk1, 01 (ICHwk3, 01) *trans.*	SBSmm1, 06	CWHvh1, 01
Soil texture	Clay loam	Clay loam – silty-clay loam	Sandy loam	Silty loam
Humus thickness (cm)	5–10	4–6	3–8	3–7
Drainage	moderately well	well	well	moderately well
Elevation (m)	847	1100	1340	35
Competing species	Bluejoint, fireweed	Black huckleberry, false azalea, western mountain ash, rhododendron, five-leaved bramble	Mountain alder, black huckleberry, soopolallie, aspen, pine grass	Salal, deer fern, salmonberry, thimbleberry, fireweed
History	Selectively logged 1966 Logged 1977 Winter sheared 1985/86 Site prepared 1987 Planted 1987	Logged 1987/88 Site prepared 1989 Planted 1989	Logged 1988 Site prepared 1989 Planted 1989	Logged 1980 Burned 1981 Planted 1982 – failed Site prepared 1988 Planted 1988
Species planted	Interior spruce	Interior spruce	Lodgepole pine	Western redcedar
Stock	PSB 313	PSB 313	PSB 313	2+0 PSB 313

TABLE 2. Site preparation treatments, by site

Iron Creek	Goat River	Canim Lake	Toquart Bay
Hawk patch 46 × 43 cm	Hawk patch	Hawk patch 30 × 30 cm	Cw, Hawk patch 30 × 30 cm
Boot screef	Boot screef	Hawk patch 100 × 100 cm	Cw, Hawk patch 60 × 60 cm
		Hawk mixed 30 × 30 cm	Cw, Boot screef
		Boot screef	

The Iron Creek and Goat River sites were planted with interior spruce and monitored for seven years. The average dimensions of the patches formed with the Hawk Power Scalper at Iron Creek were 46 × 43 × 12.5 cm. The Canim Lake site was planted with lodgepole pine and monitored for seven years. In addition to making scalps, the Hawk was fitted with a guard attachment to create mixes. The guard prevented the displaced material from scattering, thereby retaining a loose pile of mixed organic material and mineral soil at one end of the patch. At Toquart Bay, western redcedar was planted and monitored for nine years.

Results

At Iron Creek, no meaningful differences in seedling performance were observed between the Hawk Power Scalper and boot screef treatments after seven years (Table 3).

At Goat River, there were no significant differences observed in height growth. The Hawk patch treatment yielded significantly lower diameter and volume for interior spruce. Survival was high for all treatments.

TABLE 3. Summarized final assessment results of four trials with the Hawk Power Scalper. For each site, treatments with the same row letter are not significantly different (a=0.05).

Site	Iron Creek		Goat River		Canim Lake				Toquart Bay		
Crop species	Interior spruce		Interior spruce		Lodgepole pine				Western redcedar		
Age (y)	7		7		7				9		
Treatment	46 × 43 patch	Boot screef	Hawk patch	Boot screef	30 × 30 patch	100 × 100 patch	30 × 30 mix	Boot screef	30 × 30 patch	60 × 60 patch	Boot screef
Height (cm)	69.3 *a*	71.1 *a*	118.8 *a*	127.9 *a*	206.0 *a*	208.4 *a*	206.1 *a*	206.7 *a*	157.2 *a*	156.8 *a*	153.9 *a*
Diameter (cm)	1.00 *a*	1.03 *a*	2.50 *b*	2.88 *a*	3.50 *a*	3.64 *a*	3.70 *a*	3.56 *a*	2.28 *a*	2.27 *a*	2.24 *a*
Volume (cc)	26.1 *a*	28.2 *a*	235.9 *b*	321.5 *a*	887.2 *a*	906.1 *a*	932.3 *a*	900.7 *a*	325.6 *a*	360.6 *a*	319.9 *a*
Survival (%)	73.3 *a*	68.7 *a*	96.6 *a*	96.6 *a*	90.7 *ab*	88.0 *bc*	94.7 *a*	84.7 *c*	81.8 *a*	79.7 *a*	80.7 *a*

At Canim Lake, there were no meaningful differences in height, diameter, or volume between the four treatments. Some significant differences in survival were observed after seven years, with the highest survival (95%), occurring with the Hawk mixing treatment and the lowest (85%), with the boot-screef treatment.

The Toquart Bay site showed no meaningful differences in height, diameter, volume, or survival among the redcedar treatments.

Discussion

The results from the four trials reviewed did not demonstrate that any benefits in improved seedling performance are associated with site preparation treatments with a Power Hawk Scalper. Some significant improvement in survival was observed at Canim Lake between the Hawk mixing and boot-screefing treatments, but overall survival was still adequate. Diameter and volume of seedlings planted in Hawk patches were significantly poorer than some other treatments at Goat River. At Goat River, it is anticipated that the untreated seedlings (i.e., boot-screef planted) will achieve free growing status without further treatment. At this site, the Hawk treatment was a hindrance rather than a benefit.

Competing vegetation was a major factor affecting seedling development at the three other sites. The Hawk Power Scalper was not able to effectively control vegetative competition at those sites. Iron Creek and Toquart sites can be considered backlog because long regeneration delays occurred between harvest and trial establishment (Table 1). The Hawk Power Scalper could not provide adequate disturbance to control aggressive competition from established bluejoint (*Calamagrostis canadensis*) at Iron Creek, or salal (*Gaultheria shallon*) at Toquart Bay. Both species have considerable below-ground biomass that would not have been adequately removed by the Hawk Power Scalper. At Iron Creek, the patch treatment would not have alleviated snow press, nor increased available light. While some initial control of competing vegetation was achieved at Canim Lake, aspen and alder subsequently invaded regardless of the site preparation treatment. It is interesting to note that the larger one metre scalp did not improve seedling performance significantly over the 30 cm patch.

At Goat River, cold soil temperatures and short growing seasons are growth-limiting factors that were not ameliorated by the Hawk Power Scalper patch treatment. Ponding of water in the patches likely occurred at the interior sites where soils were fine textured or received seepage. This may have exacerbated limiting factors such as cool soil temperatures, poor aeration, and vegetation competition.

Conclusions

Other than a slight improvement in survival at Canim Lake, the results from the four trials reviewed did not demonstrate that any benefits in improved seedling performance are associated with site preparation treatments with a Power Hawk Scalper. These trials occurred on mesic and sub-hygric sites, and long-term trials on drier sites were not examined. The Hawk Power Scalper did not alleviate growth-limiting factors such as competing vegetation or cold soil temperatures, and may have exacerbated problems on cold wet sites. It may be a useful tool on sites with vegetation cover or debris where some light site preparation is required to facilitate planting. It should not be used on sites where moisture will pond.

Acknowledgements

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